

piston 142 toward inner end 144 which forces the syrup in inner end 144 through passageway 164 and check valve 162 in the nozzle 10. The movement of piston 142 causes a less than atmospheric pressure in outer end 146 which back-biases check valve 154 and forward-biases check valve 156. This low pressure is communicated to diaphragm chamber 166 by passageway 158 which forces diaphragm 168 to move valve spool 170 to open port 182 allowing syrup to flow through diaphragm chamber 166 and check valve 156 into outer end 146 as demanded by the speed of piston 142. The above operation will continue, providing an equal ratio (generally five parts soda to one part syrup) of soda to syrup for each stroke until solenoid 12 is deenergized.

When solenoid 12 deenergizes, passageway 128 is closed and passageway 133 communicates upstream pressure to outer end of chambers 102 and 106. Therefore, regardless of position and pistons 100 and 104, upstream pressure is communicated to outer end of chambers 74 and 78. At that time both pistons 76 and 80 will close ports 84 and 92, respectively and soda flow will stop. Pistons 120 and 142 no longer move and therefore diaphragm chamber 166 of the demand regulator 194 returns to atmospheric pressure and port 182 closes and all syrup flow stops.

What is claimed is:

1. A beverage dispenser apparatus for dispensing through a nozzle a preestablished volume of a syrup and a preestablished volume of a soda to be intermixed within said nozzle, both said syrup and said soda being supplied from separate sources under pressure, said beverage dispensing apparatus comprising:

a syrup side utilizing a first drive piston, said first drive piston moves to cause dispensing of said preestablished volume of syrup into said nozzle, said first drive piston being movable in both a forward and reverse direction within a syrup drive piston chamber, said syrup in said preestablished volume to be dispensed during movement of said first drive piston in said forward direction and also during movement in said reverse direction;

a soda side utilizing a second drive piston, said second drive piston moves to cause dispensing of said preestablished volume of soda into said nozzle, said second drive piston being movable in both said forward and said reverse direction within a soda drive piston chamber, soda in said preestablished volume to be dispensed during movement of said second drive piston in said forward direction and also during movement in said reverse direction, said soda drive piston chamber being spaced from said syrup drive piston chamber; and

said soda side including a pair of slide pistons, one of said slide pistons to be physically contactable and movable by said second drive piston during movement in said forward direction, the remaining said slide piston to be physically contactable by said second drive piston during movement in said reverse direction.

2. The beverage dispensing apparatus as defined in claim 1 wherein:

said first drive piston being connected to said second drive piston so both said first drive piston and said second drive piston move together in said forward direction and together in said reverse direction.

3. The beverage dispensing apparatus as defined in claim 1 wherein:

said slide pistons being physically connected together so as to be movable together in said forward direction and in said reverse direction.

4. The beverage dispensing apparatus as defined in claim

1 wherein:

dispensing of both said syrup and said soda to occur simultaneously by activation of a single dispensing solenoid, activation of said dispensing solenoid results in movement of said first and second drive pistons in either said forward direction or said reverse direction.

5. The beverage dispensing apparatus as defined in claim

1 wherein:

said syrup side including a demand regulator, said demand regulator being connected to the source of said syrup, said demand regulator functioning to control the supply of said syrup to said nozzle, said demand regulator places said syrup under ambient atmospheric pressure that is being supplied to said nozzle.

6. The beverage dispensing apparatus as defined in claim

1 wherein:

said pair of slide pistons being connected together to move in unison.

7. A beverage dispenser apparatus for dispensing through a nozzle a preestablished volume of a syrup and a preestablished volume of a soda to be intermixed within said nozzle, both said syrup and said soda being supplied from separate sources under pressure, said beverage dispensing apparatus comprising:

a syrup side utilizing a first drive piston, said first drive piston moves to cause dispensing of said preestablished volume of syrup into said nozzle, said first drive piston being movable in both a forward and reverse direction within a syrup drive piston chamber, said syrup in said preestablished volume to be dispensed during movement of said first drive piston in said forward direction and also during movement in said reverse direction;

a soda side utilizing a second drive piston, said second drive piston moves to cause movement of which causes dispensing of said preestablished volume of soda into said nozzle, said second drive piston being movable in both said forward and said reverse direction within a soda drive piston chamber, soda in said preestablished volume to be dispensed during movement of said second drive piston in said forward direction and also during movement in said reverse direction, said soda drive piston chamber being spaced from said syrup drive piston chamber; and

said soda side including a three-way valve, said three-way valve controlling the supply of soda to said nozzle, said three-way valve being contactable by a pair of valve pistons, said valve pistons being in axial alignment relative to said three-way valve with one of said valve pistons being on the opposite side of said three-way valve from the other said valve piston, activation of said valve pistons result in movement of said three-way valve in either said forward or said reverse direction.

8. The beverage dispensing apparatus as defined in claim 7 wherein:

said soda side including two separate outlet valves, each said outlet valve connected to a separate passageway for supplying soda into an outlet passageway, said outlet passageway in said forward direction causes one said outlet valve to be closed and the remaining said outlet valve to be open, movement of said second drive piston in the reverse direction causes the said remaining outlet valve to be open and the first said outlet valve to be closed.

\* \* \* \* \*

9. A beverage dispenser apparatus for dispensing through a nozzle a preestablished volume of a syrup and a preestablished volume of a soda to be intermixed within said nozzle, said beverage dispensing apparatus comprising:

a soda inlet for connection to a source of soda under pressure;

a syrup inlet for connection to a source of syrup;

a syrup section connected to said syrup inlet utilizing a first drive piston, said first drive piston moves to cause dispensing of said preestablished volume of syrup into said nozzle, said first drive piston being movable in both a forward and reverse direction within a syrup drive piston chamber, said syrup in said preestablished volume to be dispensed during movement of said first drive piston in said forward direction and also during movement in said reverse direction;

C1 a soda section utilizing a second drive piston, said second drive piston moves to cause dispensing of said preestablished volume of soda into said nozzle, said second drive piston being movable in both said forward and said reverse direction within a soda drive piston chamber, soda in said preestablished volume to be dispensed during movement of said second drive piston in said forward direction and also during movement in said reverse direction, said soda drive piston chamber being spaced from said syrup drive piston chamber, wherein said first drive piston is connected to said second drive piston so both said first drive piston and said second drive piston move together in said forward direction and together in said reverse direction; and

a piston drive control connected between the soda inlet and the soda drive piston chamber, and powered by soda pressure, the piston drive control having an on state in which soda under pressure is routed to alternate sides of the second drive piston to cause reciprocal motion of the first and second drive pistons, and having an off state in which soda under pressure is routed to prevent movement of the first and second drive pistons.

C1 10. The beverage dispensing apparatus of claim 9 wherein:  
said piston drive control includes first and second slide pistons, the first slide piston being  
physically contactable and movable by said second drive piston during movement in  
said forward direction, and the second slide piston being physically contactable by  
said second drive piston during movement in said reverse direction.

11. The beverage dispensing apparatus of claim 10 wherein:  
said first and second slide pistons are physically connected together so as to be movable  
together in said forward direction and in said reverse direction.

C2 12. The beverage dispensing apparatus of claim 9 wherein the piston drive control includes:  
first and second soda inlet valves for selectively connecting first and second ends,  
respectively, of the soda drive piston chamber to the soda inlet.

13. The beverage dispensing apparatus of claim 12 wherein the soda section includes:  
first and second soda outlet valves for selectively connecting the first and second ends,  
respectively, of the soda drive piston chamber to the nozzle.

C3 14. The beverage dispensing apparatus of claim 13 wherein the piston drive control includes:  
first and second valves associated with the first and second ends of the soda piston drive  
cylinder for switching fluid connections in the piston drive control each time the  
second drive piston approaches one of the first and second ends.

15. The beverage dispensing apparatus of claim 13 wherein a demand regulator is connected  
between the syrup input and the syrup drive piston chamber.

16. The beverage dispensing apparatus of claim 15 wherein the syrup section includes:  
a first syrup inlet valve connected between the demand regulator and a first end of the  
syrup drive piston chamber; and  
a second syrup inlet valve connected between the demand regulator and a second end of  
the syrup drive piston chamber.

17. The beverage dispensing apparatus of claim 16 wherein the syrup section includes:  
first and second syrup outlet valves connected between the first and second ends,  
respectively, of the syrup drive piston chamber and the nozzle.

18. The beverage dispensing apparatus of claim 9 and further comprising:  
an on/off control connected to the piston drive control for determining whether the piston  
drive control is in the on state or the off state.

19. A dispensing valve for dispensing from a nozzle a predetermined volume of a first liquid  
and a predetermined volume of a second liquid, the beverage dispensing valve comprising:  
a valve body having a first inlet for connection to a pressurized source of the first liquid and  
a second inlet for connection to a source of the second liquid;  
a first section of the valve body having a drive piston, the drive piston being movable in  
both a forward and a reverse direction within a drive piston chamber between first  
and second ends thereof, and the drive piston chamber having a predetermined  
volume;  
a second section of the valve body connected to the second inlet having a driven piston, the  
driven piston being movable in both the forward and reverse directions within a  
driven piston chamber between first and second ends thereof, the driven piston  
chamber having a predetermined volume, the drive piston chamber being spaced  
from the driven piston chamber, and the drive piston connected to the driven

piston so that both the drive piston and the driven piston move together in a coordinated manner in the forward and reverse directions;

a fluid powered shifting control in said valve body, the shifting control including:

first and second slide pistons, the first and second slide pistons reciprocable within first and second slide piston chambers, respectively, and the first and second slide pistons being physically connected together so as to be movable in a coordinated manner, and the first slide piston being physically contactable and movable by the drive piston during movement thereof in the forward direction as the drive piston moves adjacent the drive piston chamber first end for moving the first and second slide pistons to a first shifting position, and the second slide piston being physically contactable and movable by the drive piston during movement thereof in the reverse direction as the drive piston moves adjacent the drive piston chamber second end for moving the first and second slide pistons to a second shifting position;

a first liquid inlet valve in fluid communication with the first inlet, the first liquid inlet valve operable by fluid pressure to first and second positions thereof;

a first flow channel for providing fluid communication of the first liquid between the drive piston chamber first end and the first liquid inlet valve;

a second flow channel for providing fluid communication of the first liquid between the drive piston chamber second end and the first liquid inlet valve;

an outlet channel in fluid communication with the nozzle and the first and second flow channels;

a first valve piston in the first flow channel operable by fluid pressure for valving flow of the first liquid from the first flow channel to the outlet channel;

a second valve piston in the second flow channel operable by fluid pressure for valving flow of the first liquid from the second flow channel to the outlet channel;

a plurality of first fluid passageways for providing fluid communication of the first liquid between the first and second slide piston chambers, the first and second valve pistons and the first liquid inlet valve, so that when the first and second slide pistons are in the first shifting position the first liquid is delivered to the drive piston chamber first end moving the drive piston in the forward direction and exhausting first liquid out the drive piston chamber second end to the nozzle, and so that as the drive piston contacts the second slide piston the first and second slide pistons are moved to the second shifting piston wherein the first fluid is directed to enter the drive piston chamber second end for moving the drive piston in the reverse direction wherein first fluid is exhausted out the first end of the drive piston chamber to the nozzle, whereby the drive piston is caused to move alternately in the forward and reverse directions directing first fluid to the nozzle as a function of the volume of the drive piston chamber.

10 20. <sup>9</sup> The dispensing valve as defined in claim 19, and further including:  
a fluid flow control system including a plurality of check valves and a plurality of second fluid passageways providing fluid communication between the second inlet and the first and second ends of the driven piston chamber, and fluid communication between the first and second ends of the driven piston chamber and the nozzle, for alternately directing the second fluid to and exhausting it from opposite ends of the driven piston chamber as the driven piston is moved in the forward and reverse directions by the drive piston.

11 21. <sup>10</sup> The dispensing valve as defined in claim 20, and further including:  
a solenoid valve operable to an on state and an off state, the solenoid valve interacting with the plurality of first fluid passageways, so that in the off state equivalent pressure from the first fluid is applied to the first and second slide pistons and the first fluid inlet valve so that no movement of the drive piston in the first and second

directions occurs, and so that in the on state first fluid is delivered to the first and second slide pistons and the first fluid inlet valve in a non-equivalent manner so that reciprocal motion of the drive piston in the forward and reverse directions occurs.

12 22.

<sup>11</sup>  
The dispensing valve as defined in claim 21, and further including:  
a demand regulator between the second fluid inlet and the check valves for reducing  
pressure in the second fluid.

13 23.

<sup>9</sup>  
The dispensing valve as defined in claim 19, and further including:  
a solenoid valve operable to an on state and an off state, the solenoid valve interacting with  
the plurality of first fluid passageways, so that in the off state equivalent pressure  
from the first fluid is applied to the first and second slide pistons and the first fluid  
inlet valve so that no movement of the drive piston in the first and second directions  
occurs, and so that in the on state first fluid is delivered to the first and second slide  
pistons and the first fluid inlet valve in a non-equivalent manner so that reciprocal  
motion of the drive piston in the forward and reverse directions occurs.

14 24.

<sup>9</sup>  
The dispensing valve as defined in claim 19, and further including:  
a demand regulator between the second fluid inlet and the driven piston chamber for  
reducing pressure in the second fluid.

25. A dispensing valve for simultaneously dispensing from a nozzle a predetermined volume of  
a first liquid and a predetermined volume of a second liquid, the beverage dispensing valve  
comprising:

C5 a valve body having a first inlet for connection to a pressurized source of the first liquid and  
a second inlet for connection to a source of the second liquid;

a first section of the valve body having a drive piston, the drive piston being reciprocable within a drive piston chamber in a forward direction toward a drive piston chamber first end and in a reverse direction toward a drive piston chamber second end;

a second section of the valve body connected to the second liquid inlet having a driven piston, the driven piston being reciprocable within a driven piston chamber between first and second ends thereof respectively and the driven piston chamber having a predetermined volume, the drive piston chamber being spaced from the driven piston chamber and the drive piston connected to the driven piston so that both the drive piston and the driven piston move together in a coordinated manner;

a fluid powered shifting system in the valve body for causing the drive piston to reciprocate in the drive piston chamber alternatively in the forward and reverse directions, the fluid powered shifting system including:

first and second slide pistons, the first and second slide pistons reciprocable within first and second slide piston chambers respectively and the first and second slide pistons being physically connected together so as to be movable in a coordinated manner, and the first slide piston being physically contactable and movable by the drive piston during movement thereof in the forward direction as the drive piston moves adjacent the drive piston chamber first end for moving the first and second pistons to a first shifting position, and the second slide piston being physically contactable and movable by the drive piston during movement thereof in the reverse direction as the drive piston moves adjacent the drive piston chamber second end for moving the first and second slide pistons to a second shifting position;

a first liquid inlet valve in fluid communication with the first liquid inlet, the first liquid inlet valve operable by fluid pressure to a first position for directing the first fluid through a first flow channel into the drive piston chamber first end and for blocking flow of the first liquid through a second flow channel into the drive piston chamber second end, and operable by fluid pressure to a second position for directing the first fluid through the second flow

C5

channel into the drive piston chamber second end and for blocking flow of the first liquid through the first flow channel into the drive piston chamber first end;

an outlet flow channel for providing fluid communication from the first and second flow channels to the nozzle;

a plurality of first fluid passageways for providing fluid communication of a portion of the first liquid from the first inlet to the first and second slide piston chambers and from the first and second slide pistons chambers to the first liquid inlet valve, so that in the first shifting position first fluid is directed thereby to operate the first liquid inlet valve to the first position thereof whereby the first fluid flows into the first flow channel to the drive piston chamber first end for moving the drive piston in the reverse direction and exhausting first liquid out the drive piston chamber second end from the second flow channel to the outlet flow channel, and so that as the drive piston subsequently contacts the second slide piston the first and second slide pistons are moved to the second shifting position wherein the first liquid is directed thereby to operate the first liquid inlet valve to the second position thereof whereby the first liquid flows into the second flow channel to the drive piston chamber second end for moving the drive piston in the forward direction and exhausting first liquid out the drive piston chamber second through the first flow channel to the outlet channel whereby the drive piston is caused to reciprocate in the forward and reverse directions directing first fluid to the nozzle as a function of the volume of the drive piston chamber.

Ch

18 26.

The dispensing valve as defined in claim <sup>12</sup>25, and further including:

a first valve in the first flow channel, the first valve connected to the plurality of first fluid passageways and operable by the pressure of the first fluid presented thereby, wherein in the first shifting position of the first and second slide pistons, the first valve is operated to a closed position so that the first liquid can not flow to the outlet channel, and wherein in the second shifting position of the first and second slide pistons, the first valve is operated to an open position in which first liquid in the first flow channel is permitted to flow to the outlet channel; and

a second valve in the second flow channel, the second valve connected to the plurality of first fluid passageways and operable by the pressure of the first fluid presented thereby, wherein in the first shifting position of the first and second slide pistons, the second valve is operated to an open position so that the first liquid is permitted to flow to the outlet channel, and wherein in the second shifting position of the first and second slide pistons, the second valve is operated to a closed position in which first liquid in the second flow channel can not flow to the outlet channel.

27. The dispensing valve as defined in claim 26, and further including:

a second fluid flow control system including a plurality of check valves and a plurality of second fluid passageways providing fluid communication between the second fluid inlet and the first and second ends of the driven piston chamber and providing fluid communication between the first and second ends of the driven piston chamber and the nozzle, for alternately directing the second fluid to and exhausting it from opposite sides of the driven piston as the driven piston is moved in the forward and reverse directions by the drive piston, whereby the second fluid is dispensed out the nozzle as a function of the volume of the driven piston chamber.

28. The dispensing valve as defined in claim 27, and further including:  
a solenoid valve operable to an on state and an off state, the solenoid valve interacting with  
a second plurality of first fluid passageways, the second plurality of first fluid  
passageways fluidly connected to a portion of the flow of the first liquid at the first  
liquid inlet and to the first and second slide pistons, the first and second valves and  
the first liquid inlet valve, so that in the off state equivalent pressure from the first  
fluid is applied to the first and second slide pistons, the first and second valves, and  
the first fluid inlet valve so that no movement of the drive piston in the first and  
second directions occurs, and so that in the on state first fluid is not delivered to the  
first and second slide pistons and the first fluid inlet valve in an equivalent manner  
so that reciprocal motion of the drive piston in the forward and reverse directions  
occurs.
29. The dispensing valve as defined in claim 28, and further including a demand regulator  
fluidly connected between the second fluid inlet and the check valves so that the second fluid is  
delivered to the driven piston as demanded thereby.
30. The dispensing valve as defined in claim 25, and further including:  
a second fluid flow control system including a plurality of check valves and a plurality of  
second fluid passageways providing fluid communication between the second fluid  
inlet, the check valves, and the first and second ends of the driven piston chamber,  
and fluid communication between the first and second ends of the driven piston  
chamber and the nozzle, for alternately directing the second fluid to and exhausting  
it from opposite sides of the driven piston as it is moved in the forward and reverse  
directions by the drive piston, whereby the second fluid is dispensed out the nozzle  
as a function of the volume of the driven piston chamber.

17 21.

The dispensing valve as defined in claim 25, and further including:

a solenoid valve operable to an on state and an off state, the solenoid valve interacting with a second plurality of first fluid passageways, the second plurality of first fluid passageways fluidly connected to a portion of the flow of the first liquid at the first liquid inlet and to the first and second slide pistons and the first liquid inlet valve, so that in the off state equivalent pressure from the first fluid is applied to the first and second slide pistons and the first fluid inlet valve so that no movement of the drive piston in the first and second directions occurs, and so that in the on state first fluid is not delivered to the first and second slide pistons and the first fluid inlet valve in an equivalent manner so that reciprocal motion of the drive piston in the forward and reverse directions occurs.

18 22.

The dispensing valve as defined in claim 25, and further including a demand regulator fluidly connected between the second fluid inlet and the driven piston chamber so that the second fluid is delivered to the driven piston as demanded thereby.

33. A beverage dispenser apparatus for dispensing through a nozzle a preestablished volume of a syrup and a preestablished volume of a soda to be intermixed within said nozzle, said beverage dispensing apparatus comprising:

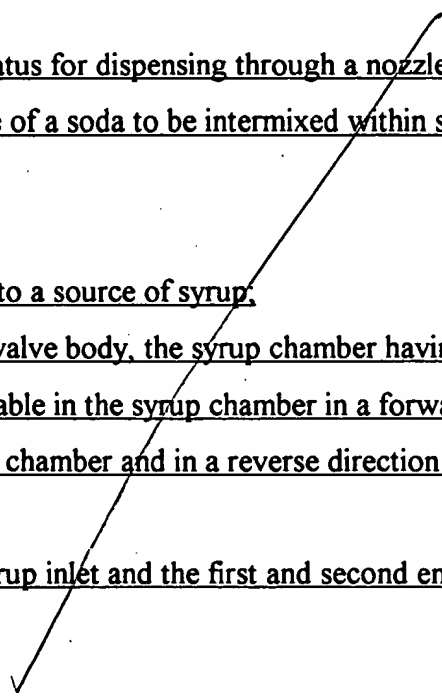
a valve body;

a syrup inlet for connection to a source of syrup;

a syrup chamber within the valve body, the syrup chamber having first and second ends;

a syrup piston which is movable in the syrup chamber in a forward direction toward the first end at the syrup chamber and in a reverse direction toward the second end of the syrup chamber;

means for connecting the syrup inlet and the first and second ends of the syrup chamber;



C6

means for connecting the first and second ends of the syrup chamber and the nozzle;

a soda inlet for connection to a source of soda under pressure;

a soda chamber within the valve body, the soda chamber having first and second ends;

a soda piston which is movable in a forward direction toward the first end of the soda

chamber and in a reverse direction toward the second end of the soda chamber, the

soda piston being connected to the syrup piston so that the soda and syrup pistons

move together in the forward direction and the reverse direction; and

a piston drive control connected between the soda inlet and the first and second ends of the

soda chamber, and powered by soda pressure, the piston drive control having an on

state in which soda under pressure is routed alternately to the first and second ends

of the soda chamber to cause reciprocal motion of the soda and syrup pistons, and

having an off state in which soda under pressure is routed to prevent movement of  
the soda and syrup pistons.

34. The beverage dispensing apparatus of claim 33 wherein the piston drive control includes:

a first slide piston physically contactable and movable by the soda piston during movement

in a forward direction; and

a second slide piston physically contactable by the soda piston during movement in the

reverse direction.

35. The beverage dispensing apparatus of claim 34 wherein:

the first and second slide pistons are physically connected together so as to be movable

together in said forward direction and in said reverse direction.

36. The beverage dispensing apparatus of claim 33 wherein the piston drive control includes:

first and second soda inlet valves for selectively connecting the first and second ends,

respectively, of the soda chamber to the soda inlet.

- C7
37. The beverage dispensing apparatus of claim 36 and further comprising:  
first and second soda outlet valves for selectively connecting the first and second ends,  
respectively, of the soda chamber to the nozzle.
38. The beverage dispensing apparatus of claim 37 wherein the piston drive control includes:  
first and second valves associated with the first and second ends of the soda cylinder for  
switching fluid connections in the piston drive control each time the soda piston  
approaches one of the first and second ends.
39. The beverage dispensing apparatus of claim 33 wherein a demand regulator is connected  
between the syrup input and the syrup chamber.
- C8
40. The beverage dispensing apparatus of claim 33 and further comprising:  
an on/off control connected to the piston drive control for determining whether the piston  
drive control is in the on state or the off state.
- add  
C9